Measure What Matters: Institutional Outcome Data Are Superior to the Use of Surrogate Markers to Define "Center of Excellence" for Abdominal Aortic Aneurysm Repair

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Outcome analysis is increasingly being used to develop health-care policy and direct patient referral. For example, the Leapfrog Group health-care quality initiative has proposed "evidence-based hospital" referral criteria for specific procedures including elective abdominal aortic aneurysm repair (AAA-R). These criteria include an annual hospital AAA operative volume exceeding 50 cases and provision of intensive care unit (ICU) care by board-certified intensivists. Outcomes after AAA-R are reportedly influenced by presentation (intact vs. ruptured), operative approach (endovascular vs. open, transperitoneal vs. retroperitoneal), surgeon subspecialty, case volume (hospital and surgeon), and provision of postoperative care by an intensivist. The purpose of this study was to compare our single-center results with those of high-volume centers to assess the validity of the concept that surrogate markers, such as case volume or intensivist involvement, can be used to estimate procedural outcome. A retrospective review was performed of AAA-Rs at one low-volume academic medical center from January 1994 to March 2005. Demographic data, aneurysm diameter and location, operative indications, and repair approach were documented. Postoperative complications, mortality rates, and hospital and ICU length of stay (LOS) were noted and compared to established benchmarks. During the study period, 270 patients underwent AAA-R (annual mean = 27 hospital cases and 13.4 cases/attending vascular surgeon). ICU care was provided by a dedicated vascular surgery service without routine intensivist involvement. Open, elective, infrarenal AAA-R was performed in 161 patients (60%), with a 2.5% hospital mortality rate (30-day, 3.1%). Thirty-three (12%) patients underwent elective endovascular aneurysm repair (EVAR), with no mortality. Both ICU (3.7 vs. 1.4 days, $p = 0.03$) and hospital (9.2 vs. 2.8 days, $p = 0.002$) LOS were significantly reduced after EVAR compared to open repair. Hospital LOS was significantly lower after open retroperitoneal repair compared to transperitoneal repair (6.1 vs. 10.3 days, $p = 0.001$). Thirty-five patients (13%) underwent ruptured AAA-R, with only 34.3% mortality (in-hospital and 30-day). Forty-one patients (15%) underwent repair of complex aortic aneurysms, with 14.1% mortality. There are increasing societal and economic pressures to direct patient referrals to "centers of excellence" for specific surgical procedures. Although our institution meets neither of the Leapfrog Group's proposed criteria, our mortality and LOS for both intact and ruptured infrarenal AAA-R are equivalent or superior to published benchmarks for high-volume hospitals. Individual institutional outcome results such as these suggest that patient referral and care should be based upon actual, carefully verified outcome data rather than utilization of surrogate markers such as case volume and subspecialist involvement in postoperative care.

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INTRODUCTION

Currently, there are considerable socioeconomic pressures to refer patients requiring specific procedures, including open abdominal aortic aneurysm repair (AAA-R), to a ''center of excellence'' with the express interest of improving overall patient outcomes. Leapfrog standards were established to select ''high-volume hospitals'' with postoperative care provided by board-certified intensivists in order to decrease procedural mortality of AAA-R. The review of our own institutional outcomes was prompted by recently published open AAA-R mortality data in randomized controlled studies comparing endovascular aneurysm repair (EVAR) and AAA-R, which appeared to be somewhat higher than anticipated.

Management of AAA has significantly changed since the introduction of EVAR. Two major prospective randomized controlled trials have compared EVAR and open AAA repair. Although earlier non-randomized studies reported similar mortality rates for EVAR and open repair (3.1-7% vs. 4.1-12%), more recent randomized studies have revealed favorable short-term outcome following EVAR, particularly decreased procedural mortality.[1,2] The Dutch Randomized Endovascular Aneurysm Management (DREAM) trial group favored endovascular repair over open procedures for AAAs >5 cm in diameter as their operative mortality rate for open repair was 4.6% in comparison to only 1.2% for endovascular repair.[3] The EVAR trial participants study confirmed these findings, documenting a 1.7% 30-day mortality rate for EVAR vs. 4.7% for open AAA-R.[4]

Open AAA-R procedural volume will continue to decrease as devices and technology evolve and current anatomical restrictions for EVAR are overcome. Increasing numbers of newly trained vascular surgeons will have considerably less experience in open AAA-R compared to those trained before the introduction of EVAR. In other words, fewer hospitals and fewer vascular surgeons will be qualified to perform AAA-R if non-health-care providers are permitted to make non-outcome-based decisions utilizing surrogate markers to designate centers of excellence. The purpose of the present report is to alert the medical community to the fallacy of utilizing only surrogate markers, such as case volume and mandating intensivist care, to designate ''centers of excellence.'' Rather, each institution should take the initiative to accurately define its own procedure-specific outcomes so that the precise outcome data can be used to identify such centers of excellence.

METHODS

All AAA-R cases performed from January 1994 to March 2005 at University Medical Center (Tucson, AZ) were retrospectively reviewed in order to determine annual hospital and surgeon volume as well as outcomes. Demographic data as well as pre-, intra-, and postoperative information were recorded. The demographic data for each patient included gender, age, and race. Preoperative risk factors included the following comorbidities: coronary artery disease (CAD), congestive heart failure (CHF), hypertension (HTN), smoking history, diabetes mellitus (DM), chronic obstructive pulmonary disease (COPD), chronic renal insufficiency (CRI), and end-stage renal disease (ESRD). CAD was defined by a history of myocardial infarction (MI) or angina or previous percutaneous or open revascularization procedures. CRI was defined by preoperative creatinine higher than 1.2, and ESRD was defined by being on dialysis or a history of kidney transplant. Maximal preoperative aneurysm diameter was determined and recorded as measured either by computed tomographic (CT) scan or ultrasound. We documented the operative indications, operative technique (open versus endovascular), operative approach (transperitoneal versus retroperitoneal), estimated blood loss, and packed red blood cells and cell-saver units transfused.

Postoperative morbidities included death, stroke, cardiac and pulmonary complications, graft thrombosis or endoleak, hemorrhage and postoperative transfusion requirement, acute renal failure with or without requiring hemodialysis, and gastrointestinal and infectious complications.

Pulmonary complications consisted of pneumonia and prolonged mechanical ventilation (over 48 hr), while cardiac complications focused on patients who had a clinical MI.

Gastrointestinal complications included diarrhea, ischemic colitis, and bowel obstruction. Infections included all infectious complications except pneumonia, such as septicemia and wound, graft, and urinary tract infections. We documented the length of stay (LOS) in the hospital, length of intensive care unit (ICU) stay, disposition, length of follow-up, and death date. Discharge dispositions included home, rehabilitation facilities, nursing homes, or long-term acute-care facilities. Date of death for each patient was verified using Ancestry.com's Social Security Death Index. All data were recorded in a Microsoft (Redmond, WA) Excel database and an SPSS 12 (SPSS, Inc., Chicago, IL) database.

For calculation of mortality and morbidity rates for elective infrarenal AAA-R, those cases performed